

-continued

<212> TYPE: DNA
 <213> ORGANISM: Artificial sequence
 <220> FEATURE:
 <223> OTHER INFORMATION: oligonucleotide
 <400> SEQUENCE: 96

cccgagcagat attgaacaat ggttcactga agacccaggt ccagatgaag ct

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We claim:

1. A probe for a target biomolecule, comprising:
 a molecular linker; and
 first and second functional groups linked and spaced by the molecular linker, wherein the functional groups are capable of interacting with one another or with the target biomolecule in a predetermined reaction, wherein the molecular linker links the first and second functional groups sufficiently spaced from one another such that the functional groups do not substantially interact in an absence of the target biomolecule but interact in a presence of the target biomolecule to provide a signal of the presence of the biomolecule.
2. The probe of claim 1, wherein the molecular linker maintains the first and second functional groups sufficiently spaced a distance from one another to avoid substantial entanglement of the first and second functional groups in an absence of the target biomolecule.
3. The probe of claim 1, wherein at least a portion of the molecular linker is of a sufficient rigidity to reduce interaction of the first and second functional groups in the absence of the target biomolecule.
4. The probe of claim 3, wherein at least a portion of the molecular linker comprises a molecular rod having a persistence length at least as great as a persistence length of a double-stranded DNA (dsDNA) of at least 10-150 nucleotides.
5. The probe of claim 1, wherein the molecular linker is of a sufficient length to substantially avoid interaction of the first and second functional groups in the absence of the target biomolecule, and allow interaction of the first and second functional groups in the presence of the target biomolecule.
6. The probe of claim 1, wherein the molecular linker comprises a tether, a molecular rod, or combinations thereof
7. The probe of claim 3, wherein the molecular linker of sufficient rigidity comprises a molecular rod.
8. The probe of claim 7, wherein the molecular linker of sufficient rigidity comprises multiple molecular rods linked by tethers.
9. The probe of claim 7, wherein the molecular linker of sufficient rigidity comprises multiple tethers linked by molecular rods.
10. The probe of claim 6, wherein the tether comprises polyethylene glycol (PEG).
11. The probe of claim 10, wherein the tether consists of PEG.
12. The probe of claim 6, wherein the tether is less than 187 Å in length.
13. The probe of claim 2, wherein the molecular rod comprises a double-stranded DNA (dsDNA) molecule of at least 10 nucleotides.
14. The probe of claim 13, wherein the dsDNA molecule comprises 10-140 nucleotides.

15. The probe of claim 1, wherein the functional groups permit detection or modification of the target biomolecule.

16. The probe of claim 1, wherein the functional groups comprise a nucleic acid molecule, a protein detection agent, a protein, a label, or combinations thereof.

17. The probe of claim 16, wherein the protein detection agent comprises an antibody that specifically binds to a target protein.

18. The probe of claim 16, wherein the nucleic acid molecule comprises an antisense molecule that specifically hybridizes to a target nucleic acid sequence.

19. The probe of claim 17, wherein the first functional group comprises an antibody that can specifically bind to the target protein, and the second functional group comprises one or more DNA binding sites that can specifically bind to the target protein.

20. The probe of claim 19, wherein the target protein comprises a DNA binding protein.

21. The probe of claim 16, wherein the first and second functional groups comprise antibodies that can specifically bind to a target protein.

22. The probe of claim 18, wherein the first functional group comprises a first antisense oligonucleotide, and wherein the second functional group comprises a second antisense oligonucleotide, wherein the first and second antisense oligonucleotides can hybridize to a target nucleic acid sequence under high stringency conditions.

23. The probe of claim 16, wherein the first functional group comprises a nucleic acid sequence capable of specifically hybridizing to the target nucleic acid, thereby forming a nucleic acid complex, and wherein the second functional group comprises a protein capable of cleaving the nucleic acid complex.

24. The probe of claim 23, wherein the nucleic acid sequence comprises an antisense DNA sequence that can hybridize to a target RNA under highly stringent conditions, thereby forming a DNA/RNA nucleic acid complex and wherein the protein comprises an RNase H that can cleave RNA in the DNA/RNA nucleic acid complex.

25. The probe of claim 16, wherein the first functional group comprises one or more DNA binding sites that can specifically bind to a target protein, and wherein the second functional group comprises a protein capable of cleaving the protein.

26. The probe of claim 16, wherein the first functional group comprises a polymerase, and wherein the second functional group comprises a non-hydrolyzable dNTP.

27. The probe of claim 26, further comprising multiple functional groups linked and spaced by the molecular linker to the polymerase, wherein the multiple functional groups comprise non-hydrolyzable dNTPs.

28. The probe of claim 16, wherein the functional group comprises a label.